WONDERS AND DANGER OF RADIUM.

What Science Has Learned Up to Date of the Mysterious New Element.

"But I don't know anything about radium," said Thomas A. Edison, at his shops in West Orange, N. J., the other day. "I really don't."

When Mr. Edison said this, what he meant was that he hadn't gone far enough into the properties of one of the most peculiar substances that have yet come into the field of science to satisfy his own exact mind. And there are many other scientists of renown who are quite willing to plead a similar ignorance.

One reason for this is that radium is dangerous. Another is that it costs a great deal. A third is that, comparatively speaking, it is new. But the one great reason why every investigator in the romantic field of science wants to know something about it is that radium has thrown the first shadow of doubt upon a number of long accepted theories.

What is radium? Well, to the eye of the amateur it would easily pass for a minute, at least for an innocent, powder, less flakish than common flour and not at all unlike salt. Its appearance is as innocent as that of the tiniest babe.

Unless there is a great change from the present order of things it will never be seen in any imposing quantity—a thimbleful or possibly a little more together. That's all.

Yet in this thimbleful there is death to the inexperienced and a wonderful power for those who wield it with care—a power that perhaps will cause a tremendous change in the work of scientists, chemists, electricians, surgeons, physicians and others. Why not, when, unless all accounts are askew, a girl who had been totally blind for years was enabled to tell the difference between light and darkness after one treatment with the powerful, stimulating rays of a pinch of the stuff?

BOILING DOWN OF RADIUM.

Before an amateur can talk intelligently with a scientist about radium and kindred substances he must grasp the meaning of radio-activity. That means ray activity or ray power. To M. Henri Becquerel of the French Institute is generally given the credit for having started the real study of radio-activity, although many other scientists and practical electricians had paved the way by their investigations of the various phenomena that can be produced in and out of vacuum tubes.

In 1896 M. Becquerel was conducting some experiments with various phosphorescent substances. He exposed some salts of uranium to the sunlight until they became phosphorescent, and then tried their effect upon a photograph plate.

It rained, and he put the plate away in a drawer for several days. When he took it out he was surprised to find on it a better image than he had made by exposing the plate to sunlight. And thus, by a sort of accident, he led up to the discovery of the Becquerel rays, so-called.

Then followed other discoveries along the same lines. Uranium is extracted from a metal or ore called uranite by mineralogists and popularly known as pitchblende. Every young college student who has got into geology and chemistry very far has heard of pitchblende.

Two years after Becquerel's discovery of the radio-activity of uranium Prof. Pierre Curie and Mme. Curie of Paris made some experiments with uranium. They soon made the discovery that some of the samples of pitchblende which they had were much more powerful than any uranium that they had found.

Was there something more powerful than uranium right inside the uranium? was the question that was at once suggested. They began to boil down the uranium residues, so to speak, and got their answer in the discovery of a new element to which Mme. Curie gave the name polonium, after her native land, Poland.

Then they did some more boiling down and succeeded in isolating an entirely new substance and the most radio-active yet discovered—radium. Shortly after that, Debierne discovered still another radio-active substance, to which he gave the name actinium.

That boiling-down process which produced radium meant some work. In the first place, pitchblende isn't half so plentiful as iron ore, which it closely resembles in appearance. The best of it comes from Bohemia, but it is also found in Saxony, Norway, Egypt and the United States.

In this country it has been found in North Carolina, Colorado and Utah. The pitchblende, which is a mineral oxide, is found in small lumps in veins of gold, silver and mica. Sometimes it is discovered in granite.

Comparatively speaking, it is easy to get the uranium. But to get the radium means much more. According to Prof. Curie, it is necessary to refine about 5,000 tons of uranium residues to get a kilogramme—or about 2.2 pounds—of radium.

To refine one ton of uranium residues meant an expense of about $2,000 a year or so ago. The price of a pound of radium on that basis was only about $4,500,000!

The actual price, however, is not quite so high now. The most recently quoted price of radium comes from the Société Centrale of Paris and is about $6,000 a gramme, or something like $2,721,555.90 a pound. Prof. J. J. Thomson has well said that "there is far more gold in sea water than radium, polonium and actinium in pitchblende."

TWO POWERFUL SAMPLES HERE.

Prof. Curie says that in three years all the workers in France and Germany have got together only about a pound of radium. That estimate refers to all grades of the substance, from the nearly pure to the very inferior.

The reducing of uranium residues by chemical, or even spectroscopic, analysis is impossible, according to the experts. The work is done by the far more sensitive electrical method. The Curies have been quoted as saying that the electrical analysis will detect a quantity of radium so small that it would have to be increased 5,000 times to show at all in the spectroscope.

Some of the most important work yet done in investigating the properties of radium was carried on with a sample about the size of a buckshot. With this sample M. Demarcay made his spectroscopic tests and came to the conclusion, now generally accepted, that radium was a new element. With this same sample the Curies determined the atomic weight of radium to be 225.

A good deal of the radium which has been imported into this country has passed through the hands of William J. Hammer, formerly a co-worker with Mr. Edison and now a consulting electrical engineer in this city. He obtained, over a month ago, one of the most powerful samples of radium in this country. Taking the radio-activity of uranium as the unit, the most powerful sample he has is of 300,000 radio-activity.

Another sample, said to be of the same radio-activity, has just been imported by Edward D. Adams for the American Museum of Natural History. There it will be used by George F. Kunz, the Tiffany gem expert, and Dr. Charles Baskerville of the University of North Carolina. One of their tasks will be the examination of different gems by the powerful radium rays.

These two samples are said to be the only ones of so high radio-activity in America. Up to a short time ago the greatest radio-activity of any sample sent to this country was 7,000. In fact, Prof. Curie, whose laboratory has turned out the greatest number of powerful samples of radium, has carefully refrained from sending out many of high radio-activity, preferring to keep them for his own experiments.

RADIUM VERY DANGEROUS.

If an account of what radium is and how much, or, rather, how little, there is of it is of interest, its possibilities are of even greater importance. Only a corner of the curtain has been lifted from the great field which scientific men predict will be opened as investigator after investigator discovers new properties of radium.

"Not half the story has been told yet," said Mr. Hammer. "Any substance possessing the inherent merit of radium is, in my estimation, bound to meet with important commercial applications sooner or later. It has already been used in medicine, and although the beginning in that direction is small it is highly promising."

The thing, however, upon which all scientists at present lay most emphasis in connection with the use of radium is that it is very dangerous, even in hands comparatively skilled.

The effect of radium rays is not felt quickly, but when the effect is felt it is felt with a vengeance. There is something uncanny in the experience of a man who faces radium rays for hardly much more than several minutes, goes away, resumes other work for a couple of weeks, without feeling anything out of the ordinary, and then wakes up to the fact that he has received a terrible burn.

Mr. Hammer has had one such experience and if he can avoid a repetition of it he will thank his good fortune. While attending a meeting of the American Academy for the Advancement of Science in Washington not long ago he had occasion to carry seven tubes containing radium and two of polonium between his hotel and the convention hall.

The tubes were of glass and hermetically sealed and were in small glass bottles. These bottles were wrapped in cotton and were all put in a wooden box. Without thinking just what he was doing, Mr. Hammer carried this box under his arm for several hours.

He noticed no effect at the time and, as a matter of fact, didn't think anything about it until two weeks later. Then he suddenly felt a sore spot on his side right under his arm.

It wasn't very painful at first, but the pain increased rapidly, and in a short time was so intense that he could not bear the touch of a finger upon the sore spot.

Until he had suffered somewhat for two days the cause of the trouble did not occur to Mr. Hammer's mind. The soreness lasted for more than a month. Luckily the burn—for such it really was—was not followed by any serious complication.

PROF. CURIE HIMSELF BURNED.

"Quite a number of instances are recorded of the serious character of the radium burns," said Mr. Hammer. "In talking once with Prof. Curie I asked him whether he had ever seen a kilo of radium. He said he hadn't—that less than half that amount had as yet been produced.

"'I should not care to trust myself in the same room with a kilo of it,' he said.

"I asked him why.

"'Because it would destroy my eyesight, burn all the skin off my body and probably kill me,' he said."

Prof. Curie spoke from experience. He showed Mr. Hammer the evidence—scars on his arm and hand. One of these looked as if he had had a very serious ulcer, and it was due to a radium burn. That, he said, had taken fifty-two days to heal. Another scar, which had been caused by an exposure of only five minutes to some radium of very high activity, bore the traces of a blister and slight roughness.

The scar which had taken so long to heal had been caused by an exposure of an hour and a half to radium whose radio-activity was about five thousand. Investigation has shown conclusively, according to M. Becquerel, that the longer the exposure and the higher the radio-activity the worse is the resulting burn.

MIGHT SLAY WITH RADIUM.

Mr. Hammer, who has been actively continuing his investigations, begun two years ago, has been making some interesting experiments as to the effect of radium on animals, fish, insects and bacteria. He has also carried on a number of experiments on human beings.

If a man works near radium for a short time and then attempts experiments with delicate apparatus, he will find that he and his clothes have absorbed enough radio-activity to send needles and pointers all askew. Those who work with the powerful substance have found it very difficult to keep their instruments free from the spreading radio-activity.

For several months Mr. Hammer kept his specimens of radium in a pasteboard box. The box was smashed finally so that it couldn't be used as a receptacle any longer, and Mr. Hammer tore it up.

Six days after that he noticed that the pieces were slightly luminous. Three weeks later, says Mr. Hammer in his "Radium and Other Radio-Active Substances," it occurred to him to try to stimulate the radio-activity of the cardboard, which at that time had not been near radium for a month. The stimulation was produced by the burning of magnesium wire near it. The experimenter found that he made the cardboard "brighter than it had been in the first place."

What is of still greater importance, this same cardboard still shows the evidence of imparted radio-activity although it is now nearly nine months since it was near the radium.

"A metal box and a second cardboard box used for radium were similarly affected," added Mr. Hammer.

Mr. Hammer has produced with radium a partial paralysis of the fish known as the electric ray, so that it could give no further shocks. He has, with the radium, paralyzed small fish so that they have been drowned or at least died. In talking of this, Mr. Hammer called attention to the experiments of Prof. Curie and others recently in Paris in which guinea pigs, mice and rabbits were paralyzed and later killed by placing radium near the spinal column.

"It is perfectly reasonable to suppose," said Mr. Hammer, "that people's brains might be paralyzed by putting powerful radium near their heads, say on a pillow at night or near the spinal cord, and thus produce paralysis as in the case of the animals.

WARNING FOR A FATHER.

"A gentleman called upon me recently. He declined to tell his name or give any information about himself, except that he was a well-known merchant and that he had been making some experiments of interest upon his own child, who was blind. He said:

"'The doctors have been treating my daughter with X-rays, but I have recently bought my own X-ray apparatus and am treating her myself.'

"I asked him if his doctor knew it and he said he did.

"'And I have imported some radium now,' he remarked, 'and am treating her with that.'

"He told me that his doctor had not been told of the radium treatment. My visitor said he didn't know how powerful a specimen of radium he had, but when he told me its price I saw that it must be quite powerful. I asked him how long an exposure he had made at a sitting.

"'An hour,' he calmly replied.

"I jumped up, nearly upsetting my chair.

"'My God, man!' I cried. 'Do you know what you are doing? Do you want an imbecile for a child? Do you want her scarred with burns and ulcers, as well as blind? How long have you been doing this?

"'Not very long, Mr. Hammer,' he said; 'but you frighten me.'

"'I want to frighten you,' I replied. 'It is criminal to experiment with such a powerful substance without your physician's knowledge.'

"He promised to stop it right away.

"I should not have mentioned this incident if I did not feel it my duty to warn people, whether physicians or laymen, to be exceedingly careful in experimenting with radium, especially of high power. Its serious physiological effects have been well demonstrated."

CAN'T PENETRATE ROCK SALT.

There is one striking difference between the X-ray and the radium ray. The activity, so to speak, which the former produces, ceases just as soon as it ceases to fall upon the object. The radium ray induces an activity which lasts, for a time at least. In discussing these features of the ray, Mr. Hammer, in his book on radium, mentions one similarity of the two rays. Neither pierces rock salt, which is perfectly transparent to ordinary light.

For this reason Mrs. Hammer, anxious for her husband's safety, has made the suggestion that receptacles for the tubes containing radium be made of rock salt. Mr. Hammer in his treatise advances this suggestion. Now, a box made of rock salt sounds strange, but it is perfectly possible and Mr. Hammer's laboratory contains such a box.

It is not unlikely that screens of rock salt will be widely used to protect investigators while tinkering with the rays. Lead is at present used as a shield in cancer cases.

RADIUM IN MEDICINE.

As soon as it was learned that the radium rays burned all live tissue exposed to them long enough, the possibility was presented of using radium to cure disease by killing germs, thus opening a way for Nature to replace the diseased tissues. Following this line, attempts have been made to cure cancer and lupus vulgaris, and with promising results.

Mr. Hammer for some time has been associated with several surgeons and doctors in the treatment of cases of cancer and tumor. In the course of the treatment there was first used radium of 7,000 radio-activity and for the past month a specimen whose radio-activity is 300,000 has been employed. In each case the specimen was the most powerful in the country at the time it was first used.

Whether anything can be done with radium to cure blindness is a problem. THE SUN has already given to its readers an account of the first work of this kind done—that of Mr. Hammer and his associate, Dr. Jenkins, in the case of Lillie Spitznadel. So far there has been no positive proof that radium rays have made the girl see.

Mr. Hammer and Dr. Jenkins are confident that their treatment of the girl with radium has made it possible for her to distinguish strong lights from absolute darkness. Whether they will be able to go any further in her case or in any other they are not yet prepared to say. They have taken care not to hold out any false and therefore doubly cruel hope, to the thousands of persons afflicted with blindness and eager to try any possible cure.

TESTS OF GEMS.

Another branch of work with radium rays which promises great fruit is the testing of gems and stones. Some of the most important work of that kind is already well under way at the American Museum of Natural History. The workers there will use the powerful specimen of radium presented to the museum by Edward D. Adams and put on exhibition only the other day.

There are many gems, emeralds and rubies, for instance, which are, to all appearances, not responsive to the radium rays. In an experiment carried on the other day in the museum darkroom Director Bumpus called the attention of a SUN reporter to the fact that whereas some diamonds were rendered luminous by the radium rays, other diamonds, said to be real, were not affected at all.

Somewhat in contradiction of this darkroom test is Mr. Hammer's account in his book of the testing of a diamond ring by Prof. Curie. Prof. Curie took the ring into his darkroom and held it near a pill box containing about a gramme of radium, causing the stone "to phosphoresce most beautifully." Mr. Hammer continues:

"It was as if a lighted candle had been brought near it. Prof. Curie remarked that this showed that the stone was a genuine diamond: and if it had been paste there would have been no effect produced, and that radium, therefore, constituted an excellent means for testing the genuineness of diamonds."

Mr. Kunz, the gem expert, has been greatly interested in the peculiarities of the new gem Kunzite, and one of the first things that he did with the specimen of radium at the museum was to try it on a sample of Kunzite. The gem was made luminious by the radium rays.

The penetrative character of the radium ray is not the least interesting thing about it. Mr. Hammer has made a test with a thick lead box containing six tubes of radium whose radio-activity ranged from 40 to 7,000. Under the box he put a steel magnet three-eighths of an inch thick. Beneath the magnet rested a photo-negative plate. In twenty-two hours he ended his photograph, or rather radiograph process.

In those twenty-two hours the strongest radium had bored its way through both the lead and the steel to such an extent that the negative above that radium was very light—nearly white, in fact. The section above the weakest radium was not very dark.

Mr. Hammer has also made some striking radiographs of mice which he caught in a trap. The radiograph of one of these mice was made with the animal's head in the trap, just as it had been caught. In that particular radiograph, whose exposure was three days, the wood of the trap was shown to be clearly transparent, as with the X-rays, and the steel parts were entirely opaque. The mouse itself was slightly transparent, indicating that the radium rays had fared with the animal's bones as X-rays would have fared.

WHAT IS RADIUM?

The source of all this energy is a puzzle which is likely to receive the attention of scientists for years. One of Prof. Curie's remarks on this phase is reproduced in Mr. Hammer's book. It is as follows:

"I found that the radium is setting off heat continually and in a very large amount; each gramme of the radium is setting off each hour 100 small calories, or in other words it is setting off heat enough to melt in each hour its own weight in ice.

"Where is the source of this energy? Both Mme. Curie and myself are unable to go beyond hypotheses; one of these consists in supposing the atoms of radium evolving and transforming into another simple body and, despite the extreme slowness of that transformation, which cannot be located during a year, the amount of energy involved in that transformation is tremendous.

"The second hypothesis consists in the supposition that radium is capable of capturing and utilizing some radiations of unknown nature which cross space without our knowledge."

Mr. Hammer refers to another theory, that there is going on a succession of chemical changes, causing the spontaneous projection of larger masses of material at enormous velocities; and that while certain portions are constantly dying out and becoming inert, other portions are constantly growing in strength and power. He adds this later on:

"When one considers the remarkable effects produced by radium it would almost seem that it is matter tearing itself into tiny pieces, and projecting these infinitesimally small particles through all matter at a speed from half to even the full speed of light (186,000 miles a second) and rendering all substances about it radio-active and still without appreciable loss in weight in the original substance; and without disparagement of the accepted wave theory of light one naturally 'harks back' to Newton's corpuscular theory of light.

"While various theories have been advanced to account for the phenomena of radium, there remain many things which have not been satisfactorily accounted for, and perhaps the subject which has been most widely discussed is the loss in weight of radio-active substances."

Prof. Henri Becquerel, Prof. J. J. Thomson and others have said that if a square centimetre of surface were covered with pure radium it would lose in weight only one-thousandth of a milligramme in a million years. From that it might be assumed that radium doesn't fade away so very, very fast.

WHY WEST POINT IS HEALTHY

NO ARGUMENT FOR OR AGAINST SMOKING IN THE FACT.

The Cadet Has Always Smoked on the Sly—Some Chew—But the Hard Work, the Strict Routine, Count in His Case—And What a Transformation These Make!

That the recent order permitting the West Point cadets to smoke under certain prescribed conditions will make any particular difference in the young men's habits with respect to the actual use of tobacco—that is, as to the quantity used—is not believed by the old stagers who have known the cadet for many years.

The cadets have always smoked, regulations to the contrary notwithstanding. The only difference now is that they will smoke openly instead of sneakingly, and by that much the moral tonic of the Military Academy atmosphere will be invigorated.

Not only have the cadets always smoked, but melancholy as is the admission, some of them have even chewed tobacco, though the cadet corps of the United States Military Academy at West Point is the healthiest body of young men in any educational institution in the country, if not in the world.

This is not advanced by experts in vital statistics as an argument in favor of the use of tobacco by young men. Anti-tobacco people, if they chose, are at liberty to say that the breath of the cadet corps is astonishingly good in spite of the use of tobacco. But the good breath is there. It cannot be explained away. It is shown in the steel muscles under the gray cadet uniform, the bronzed healthy color in the cadet cheeks, the clear snappy glint in the cadet eye and the buoyant elasticity in the cadet bearing and movements.

One of the most surprising features of this superb physical condition of the cadets is the rapid way in which it is brought about. One of the curiosities of the Military Academy's life is the transformation, after a few weeks of the wholesome life in the school, which young men fresh from home undergo. To appreciate this, one should see the flabby, shambling, languid and generally unpromising material which nearly always comes with each fresh batch of candidates, and then see it after even a fortnight's grind in the Academy routine. Parents would hardly recognize their own sons after a month or six weeks of it. It is a very impressive object lesson in what may be done for young men physically if you have the machinery of discipline to do it with, and the knowledge of how to set about the job, as the medical and other officers at West Point have.

The young man who only manages to stay no more than a year at the Academy goes out into the world with the all but indelible stamp of West Point upon him and with a foundation of health and habits of orderliness of living which are likely to last him through life.

In the last ten years there has been only one death from sickness in the Military Academy, a record which it is safe to say cannot be matched by any other school in the country. The mortality rate among the students, in other words, is practically nil. Aside from such incidents as colds, contusions and other trifles, the hospital authorities have comparatively little call for their services. They devote their time, and most successfully, to carrying on a warfare of prevention instead of a warfare of cure. All that the latest researches of science have discovered in the way of sanitation are applied with the iron inflexibility of military methods.

The menu of the cadets' mess hall is inspected every day by the chief surgeon of the post. All complaints as to quality of food served are rigidly investigated by him. If by chance the food gets to running too much toward this or that article of diet, the surgeon directs a change of the character which to him seems advisable. If physical symptoms in the corps are developed he adapts the food to meet those symptoms.

There are climatic conditions at West Point which make the post far from ideal as an all-the-year-round place of residence. There is often intense cold in the winter and intense heat in the summer. The transitions in winter from ice, snow and cold to mildness, slush and thawing weather are abrupt and trying. One might say that practically all the ailments from which the corps suffer are due to these climatic ordeals combined with individual carelessness after the sharp exercise which makes up so large a part of the cadet's daily routine of life.

Influenza, now and then a case of bronchitis, catarrhal troubles, and plain "colds" about cover the list of cadet afflictions in the way of illness. And when they have even a cold the cadets go to the hospital and stay in bed for a couple of days until they are over it, instead of going about their duties until something worse is developed, as is so often the case in the rough and tumble of life.

The cadet when he is "fit" has plenty to do. He never has an opportunity to forget that he is at West Point. Every hour, nearly every minute, of his time has its allotted purpose and generally its allotted, and by no means trifling, task. It is work, work, work, and yet again work, when he is in working condition; but few mothers take more tender care of their children and no mother cares for them so wisely when they are ill as does the West Pointer's alma mater. It is part of his discipline. There is no coddling. Curing is the hospital scheme—curing and preventing.

If there is any doubt as to the cadet having enough to do to keep him busy, a glance at the everyday routine will convince anybody that at least he does not lead quite a sybaritic existence. In summer, reveille sounds at 5:30 in the morning; in the winter at 6. Reveille means a peremptory command to "get a move on." From 6 to 6:20, at this season, the cadet is occupied in "policing" his room—sweeping, putting up his bed with everything folded to a nicety in just such a prescribed way. All save the emptying of slops, which falls to the lot of others.

At 6 o'clock comes the day's first order of inspection. Eight rooms are assigned to each inspector. The slightest thing awry, the faintest suspicion of carelessness (anything that remotely suggests slovenliness is a crime) is ground for an adverse report, and adverse reports are serious quantities in cadet life.

At 6:30 the cadet falls in and marches with the corps to the mess hall. At 6:30 breakfast is over and he marches back again. At 7:10 there is guard mount, including thirty-six of the old and thirty-six of the new guard—seventy-two in all. At 8:55 there is a call to quarters, which means that the first half of three of the four classes must fall in and march to recitation and that the other half must be in their rooms studying. At 9:30 the first half of the three classes marches back to their rooms and the second half goes to recitations. Practically every cadet gets two and a half hours' recitation in the five hours between 8 o'clock in the morning and 1 o'clock in the afternoon, for between noon and 1 o'clock there are two more recitations.

At 1 o'clock the corps forms and marches to dinner. At 1:45 the cadets are all back from the mess hall. At 1:57 there is call to quarters again. At 2 o'clock the corps for recitations is formed and those who are not going to recitations must be in their rooms. The recitations last until 4 o'clock in the afternoon, and at that hour the cadet gets a vacation. He can actually squander at his own devices a full fifteen minutes. At 4:15 the corps is formed for drill and he is kept hard at it marching, signalling, sweeping over the plain in mad gallops in clouds of dust of rattling, bumping, banging batteries of artillery; setting up tents; off on swift, hard marches. Then the manual of arms and all the rest of it until 5:20—one hour and five minutes of the hardest kind of work.

He has ten minutes to hustle to his room, get off the sweat and grime of his hot campaigning, shed the clothes in which he did that same campaigning and come out all spick and span in full dress of immaculate white duck trousers, polished boots, trim gray coat—all absolutely flawless and speckless under the searching eye of stern inspection. All this he must do in the ten minutes between 5:20 and 5:30, for at 5:30 there is the awful ceremonial of dress parade, under the critical eye maybe of experts from foreign armies or bigwigs from Washington.

After parade the corps is marched to barracks and formed, while the orders and delinquencies for the day are read. Then the cadets are dismissed. They have the munificent time allowance of five minutes in which to get to their rooms, take off their full dress, put on their fatigue uniforms and fall in for supper. About thirty minutes is devoted to supper and then there is the second vacation of the day. The cadet has twenty minutes in which to get his breath after supper, making thirty-five minutes in all since he responded to the imperative reveille in the morning.

Twenty minutes after being disbanded, when the corps has marched from supper, there is call to quarters, when every cadet must be in his room. Ten minutes later the rooms are inspected. At 9 o'clock in the evening beds may be made down and the cadet may go to bed if he likes. At 10 o'clock he must be in bed and all lights out, for at that hour "taps" sound.

From about Oct. 1 every fourth class man has to spend one-half hour every day in the gymnasium under regular instruction, and between 11 and 12 every day the men of the first class are under instruction in the riding school, one-half the class on one day and the other half on the next. What instructions in the riding school means in the way of hard work those who have seen the exhibition riding school duels at West Point at commencement time can best judge.

And that is, in outline, the routine of the life, year in and year out, for four years—barring a vacation at the end of the first two years—which the cadet leads at West Point. That is why he is the healthiest animal in all the world—that and the pure air, the pure water, the plain, wholesome food and the watchful eye of a medical gentleman abreast of the highest modern advance in the science of sanitation and hygiene.

A separate chapter might be written on the cadet appetite. It is a fearful and wonderful thing—a very prodigy in the way of powers of food consumption. The United States rations are the most generous in the world. No private in any army has so much and so good food as the private in the army of Uncle Sam. And yet the United States Army enlisted man only gets a ration of a little over three pounds of food in a day. The West Point cadet averages a consumption of more than five pounds of food a day.

Here is a sample of what the food is—a menu for one day, taken at hazard from those kept on file by Capt. Franklin, who has charge of this important feature of the Academy life:

DINNER.
Cream of Celery Soup.
Sliced Tomatoes.
Roasted Beef.
Mashed Potatoes.
Fried Egg Plant.
Bananas.
Bread and Butter.

SUPPER.
Cold Roast Beef and Sardines.
French Fried Potatoes.
Jumbo Buns.
Stewed Apples.
Milk. Coffee. Tea. Bread. Butter. Syrup.

BREAKFAST.
A cereal.
Broiled Lamb Chops.
Potatoes Stewed in Cream.
Tea Biscuit.
Milk. Coffee. Tea. Bread. Butter. Syrup.

In the old hazing days the cadets sometimes used to modify this bill of fare. For instance, syrup in cadetese is "Sammy," and the "plebe," on occasion, was compelled to "qualify in Sammy" by eating a soup-plateful of thick molasses at a sitting—required to eat it and to like it, too. But this régime is not indorsed by the highest authorities in dietetics.

Besides, hazing at West Point as it once, and not long ago, existed is a thing of the past. The vigorous administration of Col. Mills has put an end to that, and in many other ways added to the Academy's efficiency in producing that high type of manhood—the officer and gentleman.

BEST DAIRIES ARE HERE.

American Milk and Butter Compared With the European Products.

Dairy experts of the Agricultural Department say that our management of the dairy business has greatly improved in the past few years. Some ten or twelve years ago we sent to Europe a great many inferior cheeses which gave a bad name abroad to American cheese, and our exporters suffered from this reputation for a number of years. The superiority of our dairy products is, however, again recognized in foreign markets.

One of these dairy experts, who has recently been making special investigations in Europe, says that not many years ago some of the foreign milk supply establishments of Europe were greatly superior in many respects to the best in America. To-day, although some of the European milk companies do a larger business and have more extensive and costly plants than we have built, there are a considerable number of city milk supply establishments in this country which surpass any of the European plants. They are superior in their buildings and equipment, the efficiency of their management and in the purity and high average quality of the milk and cream served to their customers.

It is a remarkable fact that at the special show of perishable dairy products at the Paris Exposition, in July, 1900, where French producers had every opportunity of exhibiting their goods in the best possible shape, the only samples of natural milk and cream which were sweet and palatable after noon on the exhibition day were from dairies in New York and New Jersey, then eighteen days from the cow. There was also an exhibit of natural milk and cream from a farm in central Illinois in bottles exactly as sent daily to Chicago families, and although twenty days old the product had kept sweet until the day before the show; and even later it was better than the best French milk only from twelve to twenty-four hours after milking. The American product had been preserved solely by cleanliness and cold, and no milk supply company in Europe duplicated this performance.

The expert adds that there are many private dairies in the United States which make butter as fine as any other in the world; and the same is true of our best creameries. The best creamery butter is quite the equal of the best Danish, but there is no such uniformity of product, and a larger proportion of our butter is inferior in quality. This results from the wide extent of territory and variety in climate and local conditions which affect the 8,000 or more creameries. It is also due to the great differences in methods and management.

There is ample room for improvement in American creameries, but the only foreign country from which they can profitably learn is Denmark, where the best creameries are models of cleanliness, good order and systematic management.

The investigator says that the butter of Holland has lost its commercial standing because it is so commonly adulterated and sold as genuine butter. In nearly all other parts of Europe laws restricting and regulating the margarine trade are strict and fairly well enforced.

Fresh Normandy butter in rolls sells at the very highest price in the London market, and superior butter is made elsewhere in France in limited quantity. Yet the average quality of French butter is second-rate. Belgium is a grade higher, while Germany, Switzerland and Italy are lower. Sweden and Finland may be placed still higher and Denmark easily holds the place of honor.

EUCALYPTUS FOR CONSUMPTION

RESULTS OF RECENT EXPERIMENTS IN GERMANY.

Fifty Per Cent. of Those Treated by the New System of Inhalation Declared to Have Been Cured—Further Tests Needed, Though—It's an Australian Discovery.

Frank H. Mason, United States Consul-General at Berlin, has sent to the Department of Commerce and Labor at Washington an account of the use of eucalyptus in treating tuberculosis.

At the last meeting of the Medical Society of Berlin, he says, there was presented by Dr. Danelius and Prof. Theodor Sommerfeld an elaborate thesis describing their experiments with the system of treating tubercular disease by the inhalation of the combined fumes of eucalyptus, sulphur and charcoal. There experiments have aroused the interest of the foremost medical men of Berlin during the last six months. Concisely stated, the history and nature of the new method are as follows:

During his extensive travels in Australia, Robert Schneider, a German merchant with a practical knowledge of chemistry, noticed that the natives of the northwestern part of Australia used a decoction made by boiling the leaves and roots of the eucalyptus tree as a remedy for consumption, which is a prevalent disease in many parts of that country. He further observed that the natives living in districtswhere the eusalyptus tree grew abundantly were generally immune from the disease, and that natives suffering from tuberculosis frequently came from other regions to live in the eucalpytus district, and with generally favorable results.

From all that he could observe and learn by inquiry, Herr Schneider concluded that the effective remedial agent was the eucalyptus, which is a germicide and an antiseptic of recognized efficiency. With the aid of a physiological chemist, he prepared a combination of flowers of sulphur, powdered charcoal and the pulverized eucalyptus leaves, impregnated with essential oil of eucalyptus. This mixture has been named sanosin and is the material that has been used in the recent experiments.

Since the time of Galen, the fumes of sulphur have been known to exert a curative effect upon sufferers from phthisis, and it appears that the combination of sulphurous acid with eucalyptus and carbon has a peculiarly effective potency in attacking the bacillus of tuberculosis. On account of its extreme volatility, sanosin is put up in sealed glass tubes, each containing a dose of about two grammes (31 grains), in which condition it is to be sold, like other medicines, through authorized druggists.

When used, the tube is broken and its contents poured on an earthenware plate heated by a spirit lamp. The volatile eucalyptus quickly evaporates, and, in combination with a small quantity of sulphurous acid fumes generated, medicates with an aromatic, penetrating odor the air of a closed room, in which the tuberculous patient lives and inhales the curative influence in an easy, natural way.

The new remedy was brought in September of last year to Berlin, where, after due consideration, it was taken in hand for elaborate scientific tests and practical experiment. Prof. Sommerfeld, who is a member of the faculty of the University of Berlin and a leading authority in pulmonary disease, and Dr. Danelius, also a lung specialist, took charge of the experiments, and a special clinic or hospital ward was opened for that purpose in the Moabit quarter.

Other physicians were assigned to the various details of the work. One made regular and frequent examinations of the sputa of the patients under treatment, keeping careful record of the changes in each case from day to day. Another made a daily inspection of their general condition, temperature, pulse, appetite, &c., so that the collective record in each individual case is the work of several expert physicians.

The patients were taken from the poorest class of sufferers, many of whom lived in damp, unsanitary dwellings. Each patient, before being admitted to the new treatment, was required to present a certificate from the Royal Hospital showing that he had been treated there and was suffering from progressive tuberculosis. Many when admitted had reached a stage at which hope of relief by ordinary means had been practically abandoned.

Thus far 120 patients have been treated of whom, it is stated, more than 50 per cent. have been discharged as cured. Some have been able, while under treatment and sleeping in the hospital at night, to spend parts of the day at their usual occupations.

The purpose of the meeting was, first, to listen to formal theses prepared and read by Dr. Danelius and Prof. Sommerfeld, describing the process of treatment and giving the detailed records of a number of difficult cases, and, second, to present in person, for examination by the assembled physicians, several of the patients who had been treated for tubercular disease by one or more of the physicians present, had received certificates from them on entering the eucalyptus clinic and were now declared to be cured.

Mr. Mason says that it is not within the province or purpose of his report to venture an opinion as to the effectiveness or permanent value of this new remedy. So many sensational cures have been announced in recent years for phthisis, cancer and other widespread human diseases that the average layman is constrained to receive the announcement of further discoveries in the same fields with a certain incredulity.

At the same time, Mr. Mason says, it must be conceded that, in view of the dominating importance of the subject, the record of what sanosin has thus far accomplished is entitled to a more than mere passing recognition. The period of experiment is, of course, too brief to form the basis of any definite conclusion.

There is a general unwillingness among physicians to accept the arrest of tubercular disease for so short a period as six months as proof of a permanent cure. Others doubt whether any process of inhalation alone can reach the ultimate seat of the disease.

It will probably be safe, Mr. Mason thinks, to accept for the present the conservative but positive statement of Dr. Engel, the expert charged during the recent experiments with the examination of the sputum, in which he has had a long experience under other forms of treatment. His statement is that under no other treatment has be seen the character of the sputum change so rapidly and uniformly, through the elimination and disappearance of bacilli and the elastic fibres peculiar to tubercular disease, as under the treatment with sanosin.

To this may be added the testimony of Dr. Danelius and Prof. Sommerfeld as follows:

"The inhalations act with greater certainty in removing the catarrh which accompanies pulmonary phthisis than any other medicinal or physical measures directed to the same end. This is shown especially by the fact that the expectoration on the one hand decreases or disappears entirely, or, on the other hand—in acute cases—changes its character.

"The fact that the patient generally is quickly relieved from the troublesome and irritating cough is of the greatest importance, especially as the sleep which is absolutely requisite for a recovery from fundamental disease can then be obtained. The appetite in almost every case increases under the influence of the inhaled vapors, and through an increased consumption of food, the second preliminary condition for the cure is furnished."

EVEN THE BURGLAR SAID NO.

One Out of the Earlier Experiences of a Retired Literary Man.

"At the outset of my career as a writer," said a now wealthy and respected retired literary man, "I had one little experience that at the time chagrined me deeply, though I have since then many a time laughed over it heartily.

"In those days my manuscript came back to me with practically unfailing regularity, as, I suppose, that of most young writers' does; and, as I had the eager industry of youth and worked hard and fast and produced a good deal of stuff, I very soon had a considerable collection of reiected manuscripts, which I kept neatly stacked up in piles in a bookcase in my room, a rapidly increasing accumulation.

"One day my room was visited by a burglar, who stripped it of pretty nearly everything portable, but never took one of my manuscripts, which I considered to be the most valuable of all my possessions. He had opened that bookcase, turned one of those piles so that he could inspect it and, when he had discovered what it was turned it partly back and so left it. My manuscript was rejected by even the burglar!

"I got some little satisfaction from the thought that he might once have been a literary man himself, who had been driven to burglary, as a means of support, by the rejection of his own manuscripts and who, prompted by a sympathetic, brotherly feeling, had now left behind what he knew I must regard as my dearest treasures. But that fancy was short-lived and I could only conclude that he had left them for the same reason that the publishers had all rejected them—because he saw no value in them: the burglar couldn't use them even as junk.

"And ridiculous as it may seem to you yet in my sensitive frame of mind, at the time, I felt this sweeping rejection keenly, though, as I said as the beginning, I came in time to laugh over the experience, and even to commend the burglar's judgment."